MOLDS AS A CAUSE OF HAY FEVER AND ASTHMA.

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This is a preliminary report, Mr. President, and more preliminary than I would like, but it is presented for two reasons: First, there is increasing evidence that molds are of practical importance as causes of asthma and hay fever, but second, any complete information will require much time and work.

Fungi are low forms of vegetation which reproduce themselves by spores. These spores develop on special structures arising from the mycellium maetrix, and the molds are classified according to the botanical variations in this terminal structure. Perfect molds, like the slime molds, the water molds (rhizopus), the yeasts, and the mushrooms, produce spores inside of capsules which rupture. The imperfect fungi, however, produce spores on the end of long stalks which break off easily and liberate the individual spores in enormous quantities. The chief classes of the imperfect fungi are penicillium, aspergillus, alternaria, hormodendrum, and cladosporium. The alternaria is particularly interesting because the spores have a characteristic size and shape which makes them easy to identify. Perhaps this accounts for some stress which has been laid on alternaria.

Mold spores are ubiquitous. They occur in the air and can be readily cultivated from plates exposed at almost any time out of doors, but the quantity so cultivated varies with the seasons, so that the curve of mold incidence in the air shows a definite rise in the early summer, with the peak lasting from the first of August until well into the fall through October. This season is much longer than that of the ragweed and perhaps it accounts for the persistence of symptoms in those "ragweed" cases whose troubles do not stop with the coming of frost.

Molds can be cultivated from the dust of houses and from the stuffing of various furniture. In a study of this problem in 1936, Conant et al,[1] were unable to show that any one mold or combination of molds was characteristic of any one house or characteristic of any one kind of furniture material whether kapok, cotton, or feathers.

The occurrence of particular molds was apparently a haphazard matter.

Last spring, Dr. Wagner and I[2] presented a paper on the bad combination of kapok plus molds. Kapok (silk floss) is a vegetable fiber used as the stuffing of cheap pillows, mattresses, and furniture. When new, extracts of this kapok give negative skin tests and new kapok pillows rarely cause asthma. After use, however, the fibers break down and extracts of old kapok cause skin tests in many persons. We showed that this breakdown depended upon the growth of molds on the kapok fiber, for when new kapok was inoculated with molds, then a similar test-positive extract could be obtained. It is not surprising to find that molds grow readily upon vegetable fiber, for molds play an important part in the rotting of leaves and stems which occurs in the forest each fall.

In combination with vegetable matter, molds can cause trouble. Can they also cause symptoms alone? So far, the literature has but few authentic reports, but since Cadham[3] in 1924 described three farmers who had asthma from rusty grain, there have been but 20 authentic cases reported. In all of these, asthma was produced artificially by causing the patient to inhale either the spores themselves, the powder made from the dried pelt of the mold growth, or the spray of a filtrate from a broth culture. It is interesting that in each case, a different mold was used in the experiment. In addition to this, Underwood[4] and later Feinberg[5] report a high percentage of good results in patients treated with mold spore extracts. This is interesting but is not proof that the molds caused the disease, for the element of non-specificity in the treatment of asthma is always hard to control. Other reports deal with the incidence of positive skin tests to mold extracts in large series of asthmatic patients. The percentages vary from 1 to 55. In the largest series reported so far, Lamson and Rogers[6] found 12.2% positive reactions to one or other of nine powdered mold pelts in 1259 patients tested. We have repeated some of this work and have found that positive skin tests to stock mold spore extracts occur in 36% of 60 asthmatic patients tested and Figure 1 is a sample of these results. Note that when applied in this routine manner, positive reactions occur to one or other mold without particular discrimination. The yeasts react commonly, but the other molds are each positive in a few cases.

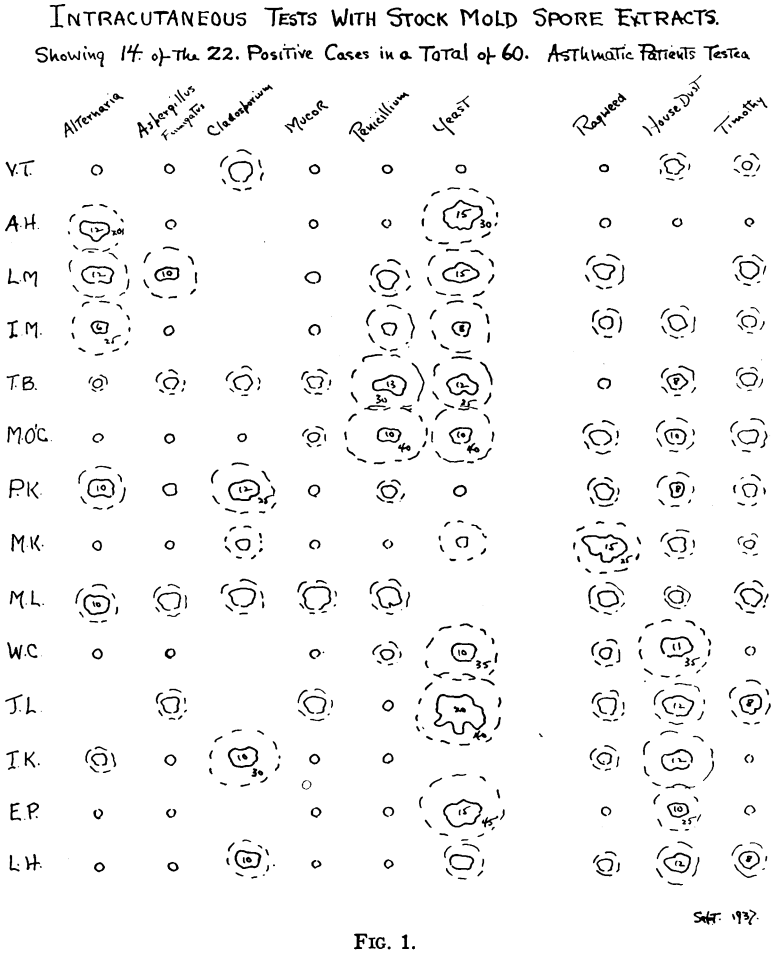

FIG. 1.

One of our cases is of particular interest and its publication has been delayed only because no other case has so far appeared to substantiate the finding. The patient is a plant pathologist, whose business it is to control the diseases in various commercial greenhouses. One important plant disease is tomato leaf mold due to the activity of cladosporium fulvum. The patient is so sensitive to this mold that the presence of it in any greenhouse is quickly ruled in or out, accord-

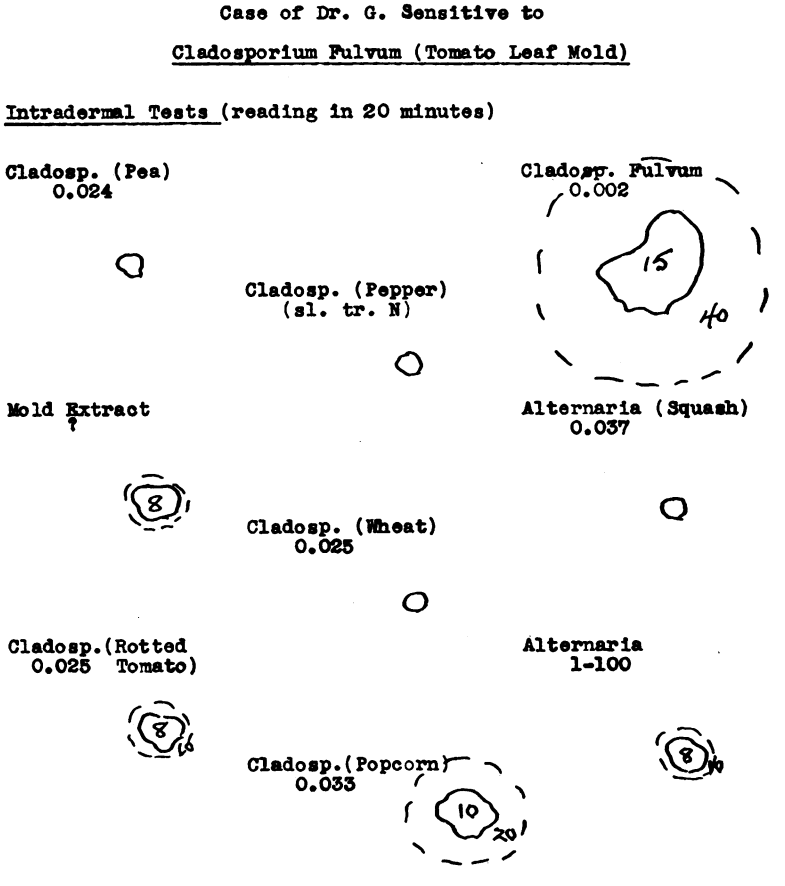

FIG. 2.

ing to whether he is attacked by sudden sneeze and wheeze as he enters the door. Skin tests made with an extract of cladosporium fulvum spores show a large reaction, and the interesting point is that this reaction is highly specific, for other tests made with related varie-

ties of the cladosporium species show little if any reaction in spite of the fact that extracts containing ten times the amount of nitrogen are used. Figure 2 shows the results. This demonstration is important, for it may well be that the confusion in this whole study may depend merely upon the fact that specificity among all the molds is of primary importance.

Further study in our clinic will include the careful isolation and identification of those many species of molds which can be cultivated from the patients' homes and then an effort to show by skin tests that the sensitiveness of the patient is directed to one and not all of these molds. Such a study will require an immense amount of work and time, and so far only one patient has been put through. This was a boy of 8, who had asthma since the age of 3, the onset occurring within a week after moving into a new house. Each year, his asthma begins in May and continues until November, except that whenever he goes away from home the asthma disappears to return again within twelve hours after he reaches home. Now since changing his residence to another home, he is well. The cultures from the old house have revealed eight varieties of penicillium, two of hormodendrum and one of alternaria. So far, skin tests show that one of the penicillia causes larger reactions than the others, and we hope that improvements in the methods of extraction and testing will make the contrast clearer.

SUMMARY.

1. Molds are ubiquitous, but occur in the air, especially in the summer, and so:—

2. Molds may explain the atypical cases of hay fever.

3. Molds occur in household dusts of all sorts and so may explain the fact that asthma may often be limited to different environments.

4. Skin tests with mold extracts are commonly observed, but their interpretation is difficult. In one case, the marked specificity in the action of the particular varieties in one mold species was striking so that

5. Specificity of mold extracts may be important, and therefore,

6. Further study will be directed toward the interrelation between the patient and the particular molds which may be found in his environment.

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